



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/815,281	04/01/2004	Young-Ro Kim	5649-1259	8354

20792 7590 04/07/2005

MYERS BIGEL SIBLEY & SAJOVEC
PO BOX 37428
RALEIGH, NC 27627

EXAMINER

WOODS, ERIC V

ART UNIT	PAPER NUMBER
----------	--------------

2672

DATE MAILED: 04/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/815,281

Applicant(s)

KIM ET AL.

Examiner

Eric V Woods

Art Unit

2672

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 April 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 12, 15-17, 19 and 22-28 is/are rejected.
- 7) ☒ Claim(s) 11, 13-14, 18, and 20-21 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 April 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date <u>20050328</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed. Namely, the title is too long – it should be no more than seven words.

The following title is suggested: Generating Interpolated Display Data Using Remote Pixel Data.

Claim Objections

2. Examiner recommends that applicant check the dependency structure on claims 15-18, as it seems that 16 and 17 should be dependent upon claim 15.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. Claims 5-6, 8-21, and 26-27 are rejected under 35 U.S.C. 112, first paragraph, as based on a disclosure that is not enabling. Details of the “Lagrangian”, which is critical or essential to the practice of the invention, but not included in the claim(s) is not enabled by the disclosure. See *In re Mayhew*, 527 F.2d 1229, 188 USPQ 356 (CCPA 1976).
5. Claims 5-6, 8-21, and 26-27 are rejected as lacking essential matter because of the use of the term “or”. Specifically, the specification does not provide enablement for the term “LaGrangian” sufficiently to allow one of ordinary skill in the art to make or use

the invention commensurate in scope with that term. Applicant is required to either a) remove the term "LaGrangian" from all claims or b) include additional material in the specification providing enablement for the term **and this must be done without introducing new matter**, and must also illustrate where in the specification support is for this specific, recited term. Further, applicant is reminded that essential subject may not be incorporated by reference from non-patent literature; as such, examiner strongly suggests to applicant to cancel this matter from the claims, as examiner believes such subject matter to be essential, and as any amendment to the specification to add will likely result in the issuance of a new matter rejection against the specification under 35 U.S.C. 112, first paragraph with result requirement to cancel the new matter. Again, this rejection is made because the use of LaGrangian polynomials for this kind of filtering application is actually very, very rare and few applications have ever been filed on that technique for this particular application, whereas the use of polyphase polynomials is very common, and references are provided that perform the recited methods to allow one of ordinary skill in the art to understand the methods recited.

6. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter, which the applicant regards as his invention.

7. Claims 3 and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "about" in claims 3 and 24 is a relative term that renders the claim indefinite. The term "about" is not defined by the claim, the specification does not

Art Unit: 2672

provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. That is, the phrase "about seven directions" does not narrow the scope of the claim compared to "plurality of directions" because "about seven" can be taken to mean the same thing as a plurality, and further it encompasses all the limitations in claims 1 and 2, so it does not narrow the scope of the claim at all, in that the number is low. If applicant wants to limit the claim to seven, then seven should be so claimed without using the 'about' terminology. Although some court cases have lent support to the use of "about" as being definite, the context is important – "about" has **only** been held to be statutory in situations where a) the specification discloses a range, b) it is understood what that range is, and c) the range is continuous (e.g. a claim of "about 50% composition" where the specification teaches 46%-53% composition would be held to be statutory, whereas in a situation like this one where the range is discrete, not continuous, and is small, and the number of directions utilized matters a great deal, it would not be). Also, there are many implementations of this kind of filter and interpolator utilizing five, six, seven, or more directions that are all well known in the art. As such, again, it is unclear what exactly is being claimed, because each of those methods tends to involve different filters.

Further, the term "about" causes the claim to not narrow the limitations of the parent claim, and as such it is improperly formed. A broad range or limitation together with a narrow range or limitation that falls within the broad range or limitation (in the same claim) is considered indefinite, since the resulting claim does not clearly set forth

the metes and bounds of the patent protection desired. Note the explanation given by the Board of Patent Appeals and Interferences in *Ex parte Wu*, 10 USPQ2d 2031, 2033 (Bd. Pat. App. & Inter. 1989), as to where broad language is followed by "such as" and then narrow language. The Board stated that this can render a claim indefinite by raising a question or doubt as to whether the feature introduced by such language is (a) merely exemplary of the remainder of the claim, and therefore not required, or (b) a required feature of the claims. Note also, for example, the decisions of *Ex parte Steigewald*, 131 USPQ 74 (Bd. App. 1961); *Ex parte Hall*, 83 USPQ 38 (Bd. App. 1948); and *Ex parte Hasche*, 86 USPQ 481 (Bd. App. 1949).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. Claims 1-3 and 22-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Greggain et al (US 6,219,464 B1)('Greggain'). (Claims 22-24 are merely a computer program implementing the methods of claims 1-3 so the rejections valid on claim1 are equally valid on them).

10. As to claims 1 and 22, Greggain teaches the use of his invention for interpolating video images (1:8-30) for arbitrary scaling or resizing factors (2:5-130) for pixels, where the system considers pixel values around a location (2:5-32), which is comparable to the "proximate to" language of the claim, and does so in "at least two different

directions" (step (i) in 2:15-21)) from the interpolation location. As such, all the limitations of the claim are met and it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the system of Greggain as it teaches all the claimed limitations.

11. As to claims 2 and 23, Greggain clearly teaches multiple directions (e.g. $n > 2$) in 2:33-63. Since only the primary reference is utilized, no separate motivation or combination is required and that from the rejection to the parent claim is herein incorporated by reference. (See Figs. 15-22).

12. As to claims 3 and 24, Greggain clearly teaches seven directions in 2:64-67, and also 21:60-67. Since only the primary reference is utilized, no separate motivation or combination is required and that from the rejection to the parent claim is herein incorporated by reference.

13. Claims 4-7 and 25-28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Greggain as applied to claim 1 above, and further in view of Shimizu (US 6,816,166 B2)('Shimizu').

14. As to claims 4 and 25, Greggain clearly teaches all the limitations except explicitly stating that low-pass filtering is taking place by filtering the direction of interpolation to determine pixel data values on points on a line that intersects horizontal or vertical lines of the display in (2:29-40 for example, where vertical lines are taught) and the directionality and filtering is taught in (2:5-30). Prima facie, interpolation in this manner is clearly filtering. Further, step (iii) of the Greggain reference clearly teaches interpolating data based on a direction of interpolation based on the region surrounding

the pixel of interest – step (ii), where these are on a line that intersects vertical lines of the display (e.g. step iii) and clearly Figs. 15-22 illustrate that. Greggain further teaches that it is determined which directions may have a low-frequency edge, e.g. step 216 in Fig. 23A and 2:5-17. Reference Shimizu clearly teaches lowpass filtering the image as well known in the art (1:10-26) and further that such is required (1:58-2:5) and that scaling requires the lowpass filter (3:64-4:10) and that his system uses it (4:40-50). Clearly, given that such scaling requires the presence of a lowpass filter (4:10-41 for example), It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the system of Greggain with that of Shimizu to get the normal lowpass filtering added in to the system, given that utilizing such methods is required in the art as set forth above, and for the fact that Greggain implicitly teaches this limitation anyway (e.g. Fig. 23A and 2:5-17).

15. As to claims 5 and 26, Greggain teaches the use of polyphase filtering in 25:45-55 (claims 39 and 40) in the direction of interpolation, where the polyphase filters are used in the directional interpolator. Since only the primary reference is utilized, no separate motivation or combination is required and that from the rejection to the parent claim is herein incorporated by reference.

16. As to claims 6 and 27, see the rejection to claim 5 above; the only difference is that filtering the pixel data values clearly consists of retrieving coefficients for processing the pixel values (e.g. for the filter (see claim 40, 25:45-55)), and this claim is substantially the same as that for claim 5, furthermore the reference performs both filtering of the direction of interpolation and the data values in the method listed in 2:5-

Art Unit: 2672

30 as stated therein. Since only the primary reference is utilized, no separate motivation or combination is required and that from the rejection to the parent claim is herein incorporated by reference.

17. As to claims 7 and 28, Greggain teaches this limitation implicitly whilst Shimizu teaches it explicitly, in 2:5-15 where a method commonly known in the art is taught to have an expanded line that differs depending on the coordinate position. Shimizu teaches weighting pixels differently based on their location with respect to the interpolated line in (5:25-34) with specific details of the (7:10-25) weighting algorithm for each pixel provided in the weighting unit 14 in Fig. 1. It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the systems of Greggain and Shimizu for the above reasons and it would have been obvious to modify the system of Greggain to utilize both direction of interpolation and spatial location information during the interpolation process as set forth by Shimizu.

18. As to claims 8 and 15, reference Greggain teaches the use of a directional interpolator explicitly in 25:45-55, where the directional interpreters use polyphase filtering to the steps listed in 2:12-35, which clearly recite in the details of the implementation (2:33-65) the use of the intersection of lines at different angles (see for example Figs. 15-22) with horizontal and/or vertical lines of screen data, where clearly for example seven lines (2:64-67) are used. Reference Greggain also clearly determines the direction of a plurality of lines passing through an interpolation location and determines a direction value (e.g. steps (i) and (ii) on 2:12-35), and clearly it outputs that value, given that interpolation occurs (e.g. steps (iii) and (iv)). Reference

Shimizu teaches the use of lowpass filtering on input data to help obtain direction information. Further, Shimizu teaches in Fig. 7B that values are checked to determine the number of pixels required on both sides of the reference.

The rejection to claim 4 is herein incorporated by reference in its entirety, as it deals with other specific issues associated with the low-pass filtering and line intersection questions, e.g. it covers the fact that Greggain also teaches interpolation based on intersection with vertical lines as well as horizontal ones. Motivation and combination is thusly taken from the rejection to claim 4 and incorporated herein by reference.

19. As to claims 9 and 16, this claim is similar to claim 8, the rejection to which is herein incorporated by reference in its entirety. The main difference is that the system of claim 9 has a memory unit, which Shimizu teaches as pixel value buffer 22 in Fig. 2, which receives input pixel data from the original image data input unit 11, and it updates and stores pixel data as required. Further, it also has a source index buffer 28, where the image is stored after has the rules applied to it and after it is processed for interpolation (as stated on the label to element 28), and to which the results of the interpolation are stored as recited in the claim. Obviously, a buffer would output its contents on receipt of a control signal, which Shimizu provides in 16:1-13, where it is stated "program control thereafter advances to the next coordinate position", e.g. the system moves the data in the buffers when a controller sends a control signal, since pixel value buffer 22 is stated to contain the eight pixels surrounding the region being interpolated, and those would be moved when the program signals to continue with the

next pixel. Finally, Shimizu teaches that the system is intended to be a controller (8:60-65) so it would prima facie send control signals.

Given that the system of Shimizu moves from one pixel to another after performing the interpolation step (which the method listed in Greggain (e.g. 2:12-35) would prima facie require) it would be obvious that it has a controller as stated above. Obviously, the filtering takes place as each pixel is examined, and so any control signal that moves data into an out of the buffers after it is filtered also controls the LPF filtering (as this happens before the data is actually interpolated) and thusly the polyphase filtering that takes place during the process.

Clearly, given that such scaling requires the presence of a lowpass filter (4:10-41 for example), It would have been obvious to one having ordinary skill in the art at the time the invention was made to combine the system of Greggain with that of Shimizu to get the normal lowpass filtering added in to the system, given that utilizing such methods is required in the art as set forth above, and for the fact that Greggain implicitly teaches this limitation anyway (e.g. Fig. 23A and 2:5-17).

20. As to claims 10 and 17, this claim is very similar to claim 8, the rejection to which is herein incorporated by reference. The main difference is that the direction determination unit performs the LPF filtering in response to the control signal. This difference is obvious and is actually inherent, because the system is known to perform the LPF filtering before the polyphase filtering, e.g. according to Shimizu as stated in the rejection to claim 4, the LPF is applied during the interpolation process, and Greggain clearly teaches in 2:5-35 that "First, an interpolation direction is selected corresponding

to any low-frequency edges in the source data.” This clearly states that low-frequency components are essential to the interpolation process. In order for those to be extracted, a lowpass filter would have to be applied. Then, once those were located, that would be included in step (i) of the method listed therein. Thusly, the LPF would be applied before the polyphase filtering actually took place, which would meet the requirements of the claim as stated above. Motivation and combination are taken from the rejection to the parent claim.

21. As to claims 12 and 19, reference Greggain clearly teaches in 21:65-67 and 22:25-67 where it is stated that the direction interpolation is varied depending on the angles found on the various vertical and oblique lines tested, where in claim 3 it clearly states that seven directions are used for determining interpolation, which would clearly result in the division of interpolation regions into seven values, with each having an assigned number that would be in format like unto the system recited in claim 13, where each direction value would take on the values of the directions recited in Greggain. Further, in 7:30-67 it is clearly taught that the quadrant of the (e.g. the determination of position) is made based on a computed alpha value for determining the directionality for the intermediate pixels. This clearly illustrates the principle of linear change based on determined direction, as illustrated in 7:53-60. As taught in 8:25-38, based on the direction, the direction is found by interpolating linearly between the endpoints of the interpolated pixel, and based on the concept of the intermediate pixel. The concept of alpha – positive or negative for both x and y axes allows a quick determination of whether or not the pixels is above or to the left of the pixel being interpolated, which

then fulfills the recited limitation of linear change between a pixel above or the left and a pixel below or to the right, as clearly those pixels are necessary to form the endpoints for determining the direction as recited 8:25-40. Motivation and combination are taken from the rejection to claim 10 above.

Allowable Subject Matter

22. Claims 11, 13-14, 18, and 20-21 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

These claims are allowable for several reasons. First of all claims 11 and 18 represent a specific implementation of a low-pass filter with specific coefficients for this application. This combination of coefficients has not been found in the prior art for this application. Secondly, claims 13 and 20 simply contain too much detail and new material to find comparable background in the prior art, with particular emphasis on the weighting factors, the specific implementations of the mappings to the threshold values, and the details on the direction. Lastly, the L-coefficient polynomials in claims 14 and 21 are not present in the prior art as far as examiner can determine.

Conclusion


Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eric V Woods whose telephone number is 571-272-7775. The examiner can normally be reached on M-F 7:30-5:00 alternate Fridays off.

Art Unit: 2672

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Razavi can be reached on 571-272-7664. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


Eric Woods


JEFFREY A. BRIER
PRIMARY EXAMINER

30 March 2005